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LINNÆUS AND AMERICAN BOTANY[1]

I HAVE been asked to make a short address to you on Linnæus and his relation to North American botany. That the selection fell on me was not because I was the most able one to deliver such an address, for there are many abler men present, but simply because I was born in the same country as Linnæus. In fact, my grandfather came from the same province of Smaland and even from a parish adjoining that of Stenbrohult, in which my illustrious countryman was born.

In the early part of the seventeenth century there lived in Jonsboda, Smaland, Sweden, a farmer named Ingemar Svenson. He had three children, two sons and one daughter, the grandmother of Linnæus. On the Jonsboda farm stood a very large linden tree, so old and with so many traditions that it was regarded by the people as a holy tree. Any damage done to this tree, it was claimed, would surely bring misfortune upon the head of the perpetrator. When the two sons began to study for the ministry, it was natural that they should think of this tree in selecting a family name. They called themselves Tiliander; *Tilia* is the Latin for the linden or basswood, and *andros* the Greek for man. It may not be amiss to state that at that

[1] Address delivered at the New York Botanical Garden, May 23, 1907, by Per Axel Rydberg, on the commemoration of the two-hundredth anniversary of the birth of Linnæus by the New York Academy of Sciences.

time the common people of Sweden did not have any family names, and this is true to a certain extent even to-day. A man was known by his given name, the given name of his father with the word son appended, and the place where he lived. The farmer mentioned above was known as Ingemar Svenson from Jonsboda. His father's name was Sven Carlson and that of his grandfather, Carl Johnson. The names of his two sons would have been Carl and Sven Ingemarson had they remained in the peasant class, instead of Carl and Sven Tiliander.

The daughter married a farmer, Ingemar Bengtson, and her son's name was Nils Ingemarson, until he entered the "gymnasium." He was also born in Jonsboda and, when selecting a name, he naturally also turned to the same old linden tree as his maternal uncles had done. He called himself Linnæus. It is remarkable that two of his father's maternal granduncles also bore another Latin form of the same name, viz., Lindelius. Some claim that even this name was derived from the same old linden tree, but this is scarcely in accordance with the facts. More likely it traces its origin from the Linden Farm in Dannäs Parish, where their ancestors lived.

But what has this genealogy to do with Linnæus's relation to North American botany? Perhaps nothing directly, but indirectly a great deal; for the circumstances and surroundings under which a man is born and reared to a certain extent make the man. In his younger days, Sven Tiliander was the house-chaplain of Field-marshal and Admiral Viscount Henrik Horn, who was for many years governor of Bremen and Verden, two cities with territory in Germany acquired by Sweden through the Thirty-years War. During his stay in Germany, Tiliander learned to know and love botany and horticulture and established around Viscount Horn's residence in Bremen a garden which was remarkable for that period. When both returned to Sweden, Tiliander brought with him the choicest plants from this garden and planted them around the parsonage of Pjetteryd Parish, of which he had been appointed rector. Here at Pjetteryd Nils Linnæus spent most of his youth, studying in company with his uncle's sons. Later, both as curate at Rashult and as rector at Stenbrohult, he surrounded the parsonages with gardens, in which he grew many rare and interesting plants. In the midst of these, Carl Linnæus, the famous botanist, was born and reared. Later, while a student at the university, he spent a summer vacation at home in 1732, and made a list of the plants in his father's garden. This list is still to be seen in the Academy of Sciences at Stockholm. Although defective, the first four classes being unrepresented, it enumerates 224 species. Of these, many were at that time very rare in cultivation. Professor Theodore Fries in his biography of Linnæus enumerates 36 of the rarest of these. Among them we notice six American plants, viz., *Rhus Toxicodendron* (the poison oak), *Mirabilis Jalapa* (four-o'-clock), *Asclepias syriaca* (milk-weed), *Phytolacca decandra* (poke-weed), *Antennaria* — now *Anaphalis* — *margaritacea* (pearly everlasting) and *Solanum tuberosum* (the potato). It may be remarked that the cultivation of potatoes was introduced into Sweden about twenty years later. We see from this that Linnæus had learned to know some American plants even in his early childhood.

Carl Linnæus was born the thirteenth of May (old style), 1707, at Rashult, an annex to the parish of Stenbrohult. His father was the curate there, but two years later, at the death of his father-in-law, Samuel Broderson, he became rector and moved to

Stenbrohult. In the fall of 1714 Carl Linnæus entered the school of Wexiö, and graduated from the "gymnasium" in 1727. His parents, especially his mother, wanted him to study for the ministry, but he had no love for theology, nor for metaphysics, nor the classics. He learned Latin tolerably, however, because that language helped him to study the natural sciences. He decided to study medicine and entered with that view the University of Lund, which was nearest his home, but remained there only one year, learning that there were better facilities at Upsala. At the latter place he soon became acquainted with Professors Rudbeck and Celsius, two of the most prominent scientists of that time, and was allowed to use their libraries. The former, who had many duties to perform, soon asked Linnæus to give for him the public lectures in botany. The income from these gave Linnæus means to support himself and linked him closer to his favorite study. He became acquainted with practically all the plants of the gardens and fields of the whole region around Upsala and learned all the scientific names given in the books at his disposal.

The latter was not an easy matter, when we take into consideration the form of scientific names at that period. For example, the most approved name of the common blue-grass that adorns our lawns was: "*Gramen pratense paniculatum majus, latiore folio, Poa Theophrasti.*" Other names of the same grass were: "*Gramen vulgo cognitum,*" "*Gramen pratense majus vulgatius*" and "*Gramen alterum et vulgare.*" In the first publication by Linnæus it appears as "*Poa spiculis ovatis compressis muticis.*" I think that Linnæus and his contemporaries had much more cause than we to exclaim: "Those horrible Latin names!" To us the same plant is known as *Poa pratensis* L., the name adopted by Linnæus in his "Species Plantarum."

The lectures given by Linnæus for Professor Rudbeck became very popular. This was especially the case after his return from his Lapland journey. Some persons, especially Dr. Nils Rosen, became jealous of his success and induced the university faculty to pass a resolution by which no one who had not taken the corresponding degree was permitted to give university lectures. Linnæus had not yet received his doctor's degree, and hence was debarred. As Holland was offering at that time excellent facilities both in medicine and in botany, and as living expenses were lower than elsewhere, Linnæus decided to visit that country and take his examinations there. He received his doctor's diploma at Harderwijk, and afterwards went to Leyden, where he became acquainted with three of the greatest botanists of the time, Boerhaave, Burmann and Gronovius. George Clifford, the wealthy burgomaster of Amsterdam and president of the East India Company, was a great lover of plants and had a splendid botanical garden at Hartecamp as well as a rich library and herbarium. On the recommendation of Boerhaave, Linnæus became Clifford's physician and curator of his collections and garden. Here he lived in luxury, beloved as a son.

Clifford furnished Linnæus with means to publish five of his first books, "Systema Naturæ," "Fundamenta Botanica," "Bibliotheca Botanica," "Genera Plantarum" and "Flora Lapponica," the manuscript of which he had brought with him from Sweden. In the first of these Linnæus presents his system of classification. He divides nature into three kingdoms, the mineral, vegetable and animal. In the vegetable kingdom he brings out an altogether new classification, based upon the sexual organs of plants. He divides the kingdom

into 24 classes, the first 23 containing the phanerogams and the last the cryptogams. In the first 11 classes are included plants which have from 1 to 12 free and practically equal stamens; in the 12th and 13th, plants with many stamens; in the 14th and 15th, plants with 4 and 6 stamens respectively, of which 2 are decidedly shorter; in the 16th, 17th and 18th classes the stamens are united by their filaments; in the 19th they are united by their anthers, and in the 20th they are adnate to the pistil; in the 21st and 22d the flowers are unisexual, *i. e.*, the stamens and pistils are in different flowers, on the same individual in the 21st and on different individuals in the 22d; and the plants of the 23d class have both unisexual and bisexual flowers. The classes were divided into orders. In the first 13 classes the orders were determined by the number of the pistils, in the 14th and 15th by the fruit, and in the 16th and 18th and 20th to 23d by the number and distinctness or union of the stamens. The classification of the 19th class is too complex to enter into here. The 24th class was divided into 4 orders: Filices, Musci, Algæ and Fungi.

This system of classification is purely artificial. Linnæus himself regarded it only as temporary, and expected that it would soon be supplanted by a more rational one, based on natural relationship. The Linnæan system served its purpose, however. It became a means by which it was possible to tabulate every known genus of plants. Before this time there had been no systems at all, or such crude ones as we find even to-day in some popular flower-books, where the plants are classified by the color of their flowers. If the natural systems of DeCandolle, Bentham and Hooker, and Engler and Prantl are too complicated for popular books, why not go back to the simple system of Linnæus? It would at least give a good insight into the structure of the flower instead of the mere color.

In his "Genera Plantarum" Linnæus applied this system to all known genera of plants and gave each of them a concise and plain description.

Clifford had many American plants in his garden, but he sent Linnæus to England to visit Sir Hans Sloane, Professor Dillenius and Philip Miller, in order to secure American plants grown by them. Both Sloane and Dillenius treated Linnæus at first with coolness, because he "confounded" botany. On his farewell visit to Dillenius, Linnæus politely asked him what he meant by "confounding botany." Dillenius took from the library the first few pages of Linnæus's own "Genera Plantarum" and showed him where there was written at numerous places "NB." Dillenius stated that all the genera so marked were wrongly described. The first example he pointed out, if I am not mistaken, was *Canna,* placed by Linnæus in his first class, which contains plants with but one stamen. Botanists before this time had described it as having three stamens. To settle the dispute they went out into the garden and the living plant showed that Linnæus was correct. Dillenius then retained Linnæus for several days and found that the older botanists in most cases were at fault and the young Swede correct. From being an opponent, he became a friend of Linnæus and let him have all the plants he wanted.

After his return to Holland Linnæus continued his work in Clifford's garden with renewed zeal, and completed his "Hortus Cliffortianus," a large folio, in which are enumerated and described all the plants found in Clifford's collections, together with synonyms and citations of nearly all botanical works then in existence. In preparing this work he became thoroughly acquainted with almost all the literature re-

ferring to American botany, such as Morison's "Plantarum Historia," Plukenett's "Almagestrum Botanicum" and "Phytographia," Petiver's "Gazophylacium," Sloane's "Jamaica," Plumier's "Plantarum Americanarum Genera," "Plantarum Americanarum Fasciculus Primus" and "Filicetum Americanum," Catesby's "Historia Naturalis," and, later, Cornuti's "Canadensium Plantarum Historia."

After completing the "Hortus Cliffortianus," Linnæus returned to Leyden, where he spent some time helping Gronovius with the editing of his "Flora Virginica," based on a large collection of plants collected by Clayton. Here again he came in contact with American plants.

Linnæus then returned to Sweden and became a practising physician. He was soon appointed professor of medicine at Upsala, but by common agreement he exchanged chairs with Rosen, who held the professorship of botany. He now began work upon the most important book of his life, his "Species Plantarum." In this he tried to include a short description of every known species of plant, together with the most important synonyms and citations. In this book the Linnæan binomial system of nomenclature was used for the first time. Linnæus was not the first to give plants names; nor was he the first to name genera. Many Latin plant-names had come down from antiquity, while others had been proposed by his predecessors. Men like Tournefort and Micheli had in some cases clearer ideas of genera than Linnæus himself. Neither was Linnæus the first one to use binomials. In Cornuti's work on Canadian plants, for example, we find almost as many binomials as polynomials; but it is doubtful if Linnæus had seen Cornuti's book when he first wrote his "Species Plantarum." He does not cite it in the first edition, but does so in the second. Linnæus was, however, the first one to use binomials systematically and consistently. Before his time botanists had recognized genera and applied to them Latin nouns as names. In order to designate species, they added to these nouns adjective descriptive phrases. These consisted sometimes of a single adjective, as in *Quercus alba,* the white oak, but more often of a long string of adjectives and adjective modifiers, as in the case of the blue-grass mentioned above. The specific name had hitherto been merely a description modifying the generic name; from this time it became really a name, although a single adjective in form. An illustration of the pre-Linnæan form of plant-names might be had if, instead of "Grace Darling," one should say, "Mr. Darling's beautiful, slender, graceful, blue-eyed girl with long golden curls and rosy cheeks." "Grace" is just as descriptive of the girl as this whole string of adjectives. It may be that "Grace" is not always applicable to the person to whom the name is applied; but this is also often the case with many specific plant-names. *Asclepias syriaca* and *Rumex Britannica* are American plants, and *Rubus deliciosus* is one of the least delicious of the raspberry tribe. This invention and strict application of binomial names could not but cause a revolution in botany. Since the appearance of "Species Plantarum" in 1753 it has been possible to pigeonhole not only genera, but also species of plants.

Before this useful book was printed, Linnæus had become better acquainted with North American plants, and in another way. Baron Bjelke, the vice-president of the Court of Appeals of Finland, had proposed to the Royal Academy of Sciences at Stockholm to send an able man to Iceland and Siberia, countries partly in the same latitude as Sweden, "to make observations and such collections of seeds and plants as

would improve the Swedish husbandry, gardening, manufactures, arts and sciences." Dr. Linnæus suggested North America instead, and recommended one of his pupils, Professor Pehr Kalm, of Abo, for the proposed expedition. Kalm spent two years in North America, traveling through Pennsylvania, New Jersey, New York and Canada, and making large collections of seeds and plants, which were preserved as living or dried specimens or as alcoholic material. During his stay at Raccoon, New Jersey, he discovered our mountain laurel. The Swedes of Raccoon called it spoon-tree, because the Indians made spoons from its hard wood. Kalm adds in his journal about this tree: "The English call this tree a Laurel, because its leaves resemble those of the *Laurocerasus*. Linnæus, conformably to the peculiar friendship and goodness which he has honored me with, has pleased to call this tree *Kalmia foliis ovatis, corymbis terminalibus,* or *Kalmia latifolia.*" Here Linnæus himself gave an illustration of both the pre-Linnæan and the post-Linnæan nomenclature. Kalm became acquainted with several of the naturalists of this country, C. Colden and his daughter Jane, Bartram and Clayton, and through Kalm a correspondence was established between them and Linnæus. Linnæus also corresponded with John Ellis, who resided in the West Indies, and Dr. Gardiner, who botanized in Carolina and Florida. Later he bought a set of plants collected by Patrick Browne in Jamaica, and received a part of the collections made by Jacquin in the West Indies.

When the second edition of the "Species Plantarum" appeared, in 1762, Linnæus knew and had described nearly 1,000 plants indigenous to the United States and Canada. Besides these, he described about 1,000 more, natives of the West Indies, Mexico and Central America, and 400 or 500 South American plants. His knowledge of American plants was small compared with what he knew of plants of the old world. "Codex Linnæanus," which enumerates all plants named by Linnæus, contains not fewer than 8,551 species.

Linnæus died January 10, 1778, honored and esteemed by all. Some of his work will doubtless live as long as botany is studied by man.

We see from the preceding account that we may consider Linnæus one of our American botanists. Even the little plant which Gronovius dedicated to the Father of Botany, the twin-flower of our woods, with its exquisite perfume and its dainty pink flowers, belongs to a genus essentially North American. The genus *Linnæa* contains four forms, all closely related. One of these, the original *Linnæa borealis,* is confined to the mountain regions of northern and central Europe. Linnæus discovered it on his Lapland journey and it was then considered a very rare plant. Now it seems to be more widely distributed than it was at the time of Linnæus. Perhaps it is of American origin and has become modified since it transplanted itself on the other side of the ocean. The other three forms are North American. *Linnæa americana* Forbes, which has usually been confounded with its European cousin, is common in the woods from Labrador to Alaska, and extends in the Rocky Mountains as far south as New Mexico. *L. longiflora* (Torr.) Howell, is found in the mountains from northern California to Alaska. The fourth form is, as far as I know, undescribed and unnamed. It is with great pleasure that I here propose the following name and description for this species:

LINNÆA SERPYLLIFOLIA sp. nov.[2]

Apparently the same plant has also been

[2] The description has been published in the *Bulletin of the New York Botanical Garden.*

collected on the island of Sachalin by F. Schmidt, but his specimens lack flowers.

P. A. RYDBERG
NEW YORK BOTANICAL GARDEN

SCIENTIFIC BOOKS

An Investigation of Evolution in Chrysomelid Beetles of the Genus Leptinotarsa. By WILLIAM LAWRENCE TOWER. Washington, D. C., Carnegie Institution.

It has been an obvious criticism of many of the recent experimental and statistical investigations of matters connected with evolution that they were entirely too narrow in their scope. Even the famous studies of the evening primroses, by de Vries, suffered from the fact that their author did not really know as much about the species of *Œnothera* as was desirable, and was even ignorant of the original habitat of the species giving rise to so many remarkable mutations. The de Vriesian studies attracted so much attention that it was not long before many skilled botanists were hot on the trail of the missing data, and to-day the whole subject is on a very much better footing.

Professor Tower, in his work on the Colorado potato beetle and its allies, has not depended upon results obtained in the laboratory alone, but has undertaken a comprehensive study of the whole of the genus *Leptinotarsa,* and even of the related genera, in the field. He has compiled all the information extant in the literature of the subject, and has made repeated trips to Mexico and elsewhere to collect and study the beetles in their native habitats. He has found Mexico to contain a large number of species of *Leptinotarsa,* having characteristic habitats and habits, all of which he has described, with photographic illustrations. Southern Mexico, it is concluded, is the center of origin of *Leptinotarsa,* and consequently the Mecca of whoever would seek to unravel the secrets of its evolution.

It is not possible, of course, to give a summary of these ecological investigations in a review, but as an example we may quote from some of the remarks on *Leptinotarsa undecimlineata:*

> An instructive illustration of the manner in which the dispersion of this beetle takes place was afforded by the recent building of a railroad through a perfectly flat, frequently flooded savanna near Tierra Blanca. The food plant grows generally over the savanna, but the beetle is entirely absent excepting at a few points along the road where the work of constructing ditches to keep the roadbed intact has created new localities with favorable conditions for their existence. Over a distance of about 18 kilometers there are now located flourishing colonies at each place where the work of the railroad builders has made existence possible, while on the unmodified savanna I have not been able to locate a single colony, and doubt if there are any. In this instance the advance into a new area has occupied two years and has been rapid. That transportation [by human means] did not bring about the starting of these colonies is certain, as the work of railroad construction was entirely suspended during the rainy season, when the beetles are active and dispersion takes place. It is perfectly clear that in this case the distribution was brought about by some few individuals from a colony happening by chance to discover the newly created habitat, proper for æstivation and for the breeding of the next generation. In each generation many will perish by not being able to reach the proper habitat after once having abandoned the parent colony, but the fact remains that some do discover proper habitats, and when such are found new colonies are established. . . . It is not necessary that the soil should be of a special chemical composition or temperature and rainfall of special amounts, but it is essential that during pupation and æstivation the beetle shall not be subjected to excessive desiccation or moisture, and that the soil shall be porous enough to admit of an abundant supply of air.

This, indeed, is real biology; and how different from some ecological writings we have seen!

When we come to the potato beetle, *L. decemlineata,* the discussion is most comprehensive. The most interesting fact brought out is the retreat of *L. juncta,* of the southern states and Atlantic seaboard, before the invading hordes of *decemlineata.* Now these two species have *different food plants,* and so apparently should not compete! It appears, however, that they freely cross, and